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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 38-60
Amendment No. 7
Project Code No. 6100

August 26, 1959 Date

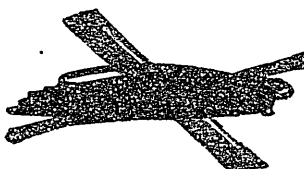
TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

1. ARPA Order No. 38, dated November 5, 1958, is hereby amended to clarify and emphasize program objectives, and to establish tasks to be performed. Tasks cited are subject to maximum funding level of \$46.9 million for FY 1960.

A. ARPA objectives in the Phase I MIDAS program are:

- (1) To gather from limited tests in orbital flight maximum engineering and scientific data pertinent for:
 - (a) Guiding further MIDAS system and equipment development.
 - (b) Enabling high-confidence prediction of MIDAS performance under all operating conditions.
- (2) To develop appropriate and reliable data-gathering equipment, including infrared sensing equipment and stabilized satellite vehicles, to implement objective (a).
- (3) To check in orbital flight the operation of equipment developed.
- (4) To perform studies aimed at optimization of system design in the light of best available data.

Emphasis is required on optimization of quantity and quality of statistical data gathered on signals produced by missile targets and by disturbing backgrounds, such as clouds. Particular emphasis is also required on development and design for maximum reliable equipment life in orbit.



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B. Approval is provided for continuation of MIDAS Phase I by performance of the following tasks:

- (1) Prepare all equipment for and carry out 4 launchings of MIDAS vehicles, launches 1 and 2 from Atlantic Missile Range beginning in January 1960.
- (2) In consonance with AMR stand limitations and ATLAS D delay, reprogram to accommodate launches 3 and 4 into polar orbit from the Pacific Coast beginning approximately July 1960.
- (3) Record and analyze infrared-signal and equipment-performance data produced by these 4 flights.
- (4) Maximize statistical background data by providing maximum geographic readout coverage, particularly in areas having strong cumulo-nimbus cloud activity at the season of launch.

Specifically, investigate and report to ARPA within 30 days on possibility of providing for MIDAS data-link reception and recording through the large steerable reflectors on Trinidad and at Prince Albert in Canada. Study and report, also, on feasibility of data reception and recording through any of several TLM-18 facilities now existing in Turkey.

- (5) Procure earliest modification of focal-plane assemblies and amplifiers of infrared scanners to provide:
 - (a) Optimized capability for gathering background data suitable for statistical analysis.
 - (b) Noise data on unilluminated cells in presence of van Allen or other radiation.
 - (c) Signal-level data accurate within ± 2 decibels or better.
 - (d) Assurance of no signal-channel overloading under any condition to be encountered in orbit.

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- (6) Program modified scanners as primary payloads on the earliest flights possible, using earlier scanners as back-up payloads, (with retrofit modification if possible). Take maximum advantage of above revised firing to insure most advanced data-gathering capability possible as payloads on all flights.
 - (7) Continue development and testing of subsystem equipment for improved performance and reliability applying intensive effort to improvement of reliability.
 - (8) Perform rigorous life tests and captive tests in support of development program, with emphasis on tests early and complete enough for results to benefit flight program.
 - (9) Continue system-optimization studies.
 - (10) Analyze quantitatively gains in false-alarm rejection practically obtainable by data-processing methods, such as the infrared analog of radar area MTI.
 - (11) Plan experiments to gather maximum data in orbit for other wavelength bands than 2.7 microns, with particular attention to 4.3 microns (CO₂ absorption) and 0.25 micron (ozone absorption). Include such experiments on late Phase I flights.
 - (12) Plan experimental program procedure to be followed in event of total failure of flights 1 and 2 to produce useful infrared data.
- C. Approval is granted for initiation of a Phase II MIDAS program. Objectives are as stated in A above, together with those of maintaining sufficient program fluidity to take full advantage of information gained from Phase I and early portion of Phase II, and of assuring suitability for later operational use in equipment developed. Tasks to be performed in the Phase II program are:

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- (1) Provide equipment for and carry out at least 6 launchings into polar orbit from the Pacific Coast--following, in proper interval, launch of flight 4 of Phase I. Time phasing should be scheduled through CY 1961 to permit smooth transition to operational system launches consistent with assumed operational system approval in early FY 1961.
- (2) Plan and operate Flights 5 through 8 as an extension of the Phase I equipment - development and data-gathering effort.
- (3) Record and analyze infrared-signal and equipment-performance data produced by these flights.
- (4) Program booster and orbital vehicles of Flights 9 and 10 as alternates to insure accomplishment of objectives of Flights 5 through 8, if needed.
- (5) Plan and operate Flights 9 and 10, unless vehicles are needed earlier as alternates, to establish suitability of equipment prototypes for the operational system, including ground equipment and environment.
- (6) Introduce extended-capability (dual burn) AGENA satellite vehicles as early as possible to provide earliest data from high-altitude orbits.
- (7) Introduce precise position control of vehicles in orbit as early as possible.
- (8) Maximize statistical background data by providing maximum geographic readout coverage, particularly in high latitudes. Specifically, assure earliest availability for MIDAS data recording of one far northern receiving facility equipped with a large steerable antenna. Investigate feasibility of recording MIDAS data through the large steerable antenna planned for early operation in Japan.

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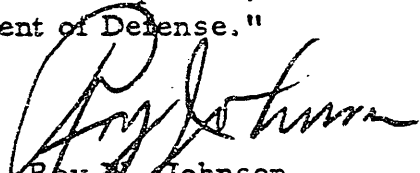
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- (10) Continue development and testing of equipment for improved performance and reliability. This includes ground equipment.
- (11) Submit within 30 days a study report detailing the factors which have led to amendment of the MIDAS Development Plan of January 30, 1959, changing the recommended operational satellite deployment from 20 vehicles in random orbits at 1000 miles to 12 vehicles in random orbits at 2000 miles. In particular, engineering data and analysis are required in support of infrared target-detection and background-rejection feasibility at the increased maximum range. Firm recommendation as to use of precise control of relative position in orbit, with full engineering analysis support, is also required in this report.
- (12) Study and report on degree and feasibility of improvement in over-all operational-system performance and geographic alarm coverage attainable by use of additional operational ground readout stations. Particular attention is to be given to such station locations as Turkey and Japan, especially with regard to feasibility of assuring unbroken data transmission from them to the continental United States in the 1962 time period.
- (13) Establish finalized operational-system concept and specifications prior to fabrication of equipment for Flights 9 and 10. Take maximum advantage of information gained from Phase I and Phase II programs to determine technical limitations which shape operational-phase objectives.
- (14) Study and report on consequences of eliminating from the satellite-borne equipment all commanded or programmed functions, except those required to establish the satellites in precise orbits and orbital positions. State characteristics of a system optimized for such operation.
- (15) Study methods of processing data from satellites to provide automatic and unambiguous recognition of missile targets. Conduct preliminary-design analysis of most promising methods.

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- (16) Study methods of improving data transmission from satellites to using agencies, looking toward improvement of extent, reliability, and effectiveness of surveillance coverage.
- (17) Continue study of areas of growth in system utility, such as: effective impact-area prediction when many missiles are launched at once, with its attendant data-correlation problems; improvement in system ability to resist possible counter-measures; and partial in-satellite data processing.
- D. Tasks beyond the scope directed may be undertaken, or effort on directed tasks deleted, only with concurrence of ARPA.
- E. Phase III is not approved at this time. Within limits of funds availability, Phase III oriented studies may be conducted. In order to achieve even limited operational capability in Calendar Year 1962, portions of the Phase III program dealing with facilities may require initiation in FY 1960. Therefore, after program reorientation in accordance with guidance and authorizations provided, particular long lead time facilities may be authorized subject to individual review of justification.
- F. ARDC is requested to submit within 30 days a revised Development and Funding Plan for approval. The Phase I, Phase II nomenclature shall be eliminated and the 10 shot program integrated into one research and development phase. The revised development plan should include total funding required by fiscal years to complete the R&D phase with the FY 1960 portion thereof, not to exceed \$46.9 million. Current plans for an operational system should be included.
- G. The fund availability under this Order is hereby increased from \$31,050,000 to a new total of \$35,550,000 under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Department of Defense."


Roy W. Johnson
Director

cc: Secretary of the Air Force